

Acknowledgements

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Improved production technology and efficiency of smallholder farmers in Ethiopia: Extended parametric and non-parametric approaches to production efficiency analysis

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Abstract

The objective of this study was to assess the impact of improved production technologies and Ethiopia's New Extension Program on the production efficiency of smallholder farmers in eastern Ethiopia. It employed an extended stochastic efficiency decomposition technique to analyze the technical, allocative, and economic efficiencies of farmers in the dry land and wet highland agro-climatic zones. It also employed an extended interspatial total factor productivity analysis to investigate the resource use efficiency and productivity of alternative cropping systems and technologies in these zones.

Although the results indicated a positive impact of improved maize technology on maize production efficiency, the study found considerable inefficiencies of maize production under both traditional and improved technology. Production inefficiency in traditional maize production is attributed more to technical inefficiency, suggesting that improvements in technical efficiency provide a greater opportunity to increase maize production. For maize production under improved technology, the results showed that production inefficiency is equally attributed to both technical and allocative inefficiencies. The results thus suggest that both technical and allocative efficiencies must be raised to increase maize production under improved technology.

Despite the positive impact of new maize technologies, however, the study found no evidence of impact of Ethiopia's New Extension Program on the overall food production efficiency of smallholder farmers. In the wet highland zone, the results indicated that the participants in the

New Extension Program used a superior technology but both groups encountered similar levels of production inefficiencies. The participants and non-participants can, respectively, increase food production by an average 35 percent and 37 percent through improved technical and allocative efficiency. The results thus indicated that the New Extension Program has had no impact on overall production efficiency in the wet highland zone. In the dry land zone, the results showed that apart from using homogeneous production technologies, the two groups of farmers do not have significantly different technical and allocative efficiencies and thus have similar overall productive efficiencies. The participants and non-participants in the dry land zone can, respectively, increase food production by an average 46 percent and 43 percent through improved technical and allocative efficiency. The results thus indicated that the New Extension Program has had no positive impact on production efficiency of farmers in the dry land zone. Education, credit, previous participation in previous extension programs, greater security of tenure, the share of the leading cropping system in each zone, and off-farm income were generally found to have a positive impact on food production efficiency.

The study found considerable variation in resource use efficiency among cropping systems in the dry land as well as wet highland zones. In the wet highland zone, cropping systems involving maize and potatoes turned out to be more efficient. While cropping systems involving maize were also superior to sorghum in the dry land zone, sorghum systems were widely practiced. This could be due to sorghum's higher tolerance to drought under the prevailing unreliable weather conditions, confirming that farmers are actually forced to adopt cropping practices that are inefficient but ensure reliable food supply in the absence of appropriate technologies.

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Acronyms and Abbreviations

ADE	Adult Equivalent
ADLI	Agricultural Development Led Industrialization
AE	Allocative Efficiency
AISCO	Agricultural Inputs Supply Corporation
AMC	Agricultural Marketing Corporation
ARDU	Arsi Rural Development Program
CADU	Chilalo Agricultural Development Program
COLS	Corrected Ordinary Least Squares
CRTS	Constant Returns to Scale
CSA	Central Statistical Authority
DAP	Diammonium Phosphate
DEA	Data Envelopment Analysis
DRTS	Decreasing Returns to Scale
EE	Economic Efficiency
EMTP	Extension Management Training Plot
ESE	Ethiopian Seed Enterprise
GDP	Gross Domestic Product
ha	Hectare
IRTS	Increasing Returns to Scale
Kg	Kilogram
LGP	Length of Growing Period
LP	Linear Programming
LR	Likelihood Ratio
LU	Livestock Unit
masl	Meters Above Sea Level
MEDaC	Ministry of Economic Development and Cooperation
mm	Millimeter
ME	Man Equivalent
ML	Maximum Likelihood
MOA	Ministry of Agriculture

MPP	Minimum Package Project
NEP	The New Extension Program
NGO	Non-governmental Organization
NSIA	National Seed Industry Agency
NSIP	National Seed Industry Policy
OLS	Ordinary Least Squares
PA	Peasant Association
PADEP	Peasant Agricultural Development Program
SFPF	Stochastic Frontier Production Function
SG	Sasakawa-Global 2000
TGE	Transitional Government of Ethiopia
TE	Technical Efficiency
VRTS	Variable Returns to Scale